

Snakes : *Typhlops reticulatus*, L. ; *Geophis lineatus*, D. & B. ; *Elaps lemniscatus*, L.

Batrachians : *Leptodactylus pentadactylus*, Laur. ; *Bufo marinus*, L. ; *Bufo typhonius*, L. ; *Cœcilia gracilis*, L.

GONATODES ANNULARIS, sp. n. (Woodcut, p. 153.)

Closely allied to *G. albogularis*, D. & B. Snout longer than the diameter of the orbit, obtuse, the granules on its upper surface small, not larger than the dorsals. Supraciliary edge with a small projecting spine, as in most species of *Sphærodactylus*. Seven upper and four or five lower labials; a pair of small chin-shields behind the mental. No transversely enlarged subcaudals. Grey-brown above, with a series of large black spots along each side of the vertebral zone; head and limbs with black spots or marblings; tail with black annuli, alternating with white spots inferiorly; lower surfaces pale brown, throat with oblique dark-brown lines converging backwards.

	millim.
Total length	86
Head	11
Width of head	7
Body	29
Fore limb	15
Hind limb	19
Tail	46

Two female specimens.

5. On the Structure of a new Genus of Lumbricidæ (*Thamnodrilus gulielmi*¹). By FRANK E. BEDDARD, M.A., F.R.S.E., Prosector to the Society, Lecturer on Biology at Guy's Hospital.

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I owe the specimens of the worm described in the present paper to the kindness of Mr. W. L. Slater, F.Z.S., who collected them for me during his recent visit to British Guiana.

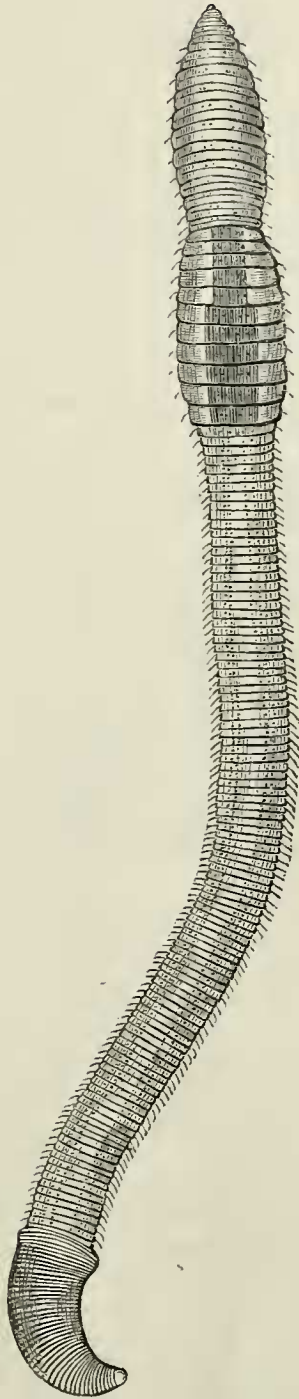
They are all rather large worms (see woodcut, fig. 1), measuring up to 6 inches in length and $\frac{3}{8}$ inch in breadth, and belong to a new genus and species of Lumbricidæ, which I propose to call THAMNODRILUS GULIELMI.

External Characters.—The colour is purplish on the dorsal and reddish yellow on the ventral side; the clitellum is distinguished from the rest of the body by its paler tint.

The mouth is situated precisely at the anterior extremity of the

¹ Named after Mr. William Lutley Slater.

Fig. 1.



Thamnodrilus guillemi, from the ventral surface; natural size.

body, and there is therefore no prostomium; in this character *Thamnodrilus* agrees with *Urochæta*¹ and *Diachæta*². It is a little difficult to distinguish the anterior segments of the body; the buccal segment is divided externally by a very well-marked furrow, which appears to mark the line of division between two really distinct somites. A consideration of the number of the nephridia (see p. 160) leads me to infer that the divisional furrow does not imply a division into somites; furthermore (see figs. 1 and 2) each of the two anterior rings is divided on each side by a longitudinal furrow, which corresponds in position with the dorsal pair of setæ in the following segments; the presence of this furrow is perhaps an additional argument in favour of regarding them as parts of the same somite.

From the first segment to about the 8th, the breadth of the segments gradually increases; the longitudinal diameter of the segments also gradually increases up to the 8th or 9th, after which they become distinctly narrower.

The segments of the *clitellum* are perfectly distinct, and are eleven in number. The *clitellum* commences with the 15th segment and terminates upon the 25th; very generally a trace of glandular modification is to be found upon the 14th and 26th segments.

The *clitellum* of *Thamnodrilus* is therefore nearly coextensive with that of *Urobenus*, *Urochæta*, *Titanus*, and *Anteus*.

As in the former genus, the *clitellum* is not developed upon the ventral side of the body, but the extent of the area left free from glandular substance varies; in the anterior part of the *clitellum*, as far back as segment 19, the ventral pair of setæ as nearly as possible mark the boundary between the glandular and non-glandular portion of the integument; from the 20th segment to the end of the *clitellum* there is a space left between the glandular part of the integument and the setæ. This is illustrated in the accompanying drawing (woodcut, fig. 2).

The *setæ* are disposed in pairs; the distance separating the ventral pairs is 2·2 mm. in the *clitellar* region, the distance between the ventral and dorsal pair is 5·5 mm., while the dorsal pairs are separated by an interval of 12·5 mm. The *setæ* are not remarkable in shape except upon the *clitellum*; here they are modified and acquire the form illustrated in the drawing (woodcut, fig. 3); these peculiarly modified *setæ* are apparently found throughout the *clitellum* (I have also found them in segments immediately anterior), where they replace both the dorsal and ventral pairs. The accompanying figure renders any minute description of these *setæ* unnecessary, and will serve to show how exactly they resemble the *clitellar setæ* of *Urochæta*; in this genus Perrier has recorded³ the modification of the ventral pair of *setæ* on the 20th segment; and Horst has stated⁴ that in another species the ventral *setæ* of four of the

¹ Perrier, Arch. de Zool. Expér. t. iii.

² Benham, Quart. Journ. Micr. Sci. 1886.

³ Arch. d. Zool. Expér. t. iii. (1874) p. 399, pl. xvii. fig. 52.

⁴ Midden Sumatra, Vermes, p. 8.

clitellar segments are thus modified. This latter statement I am able to confirm from the study of an Australian species of the genus, possibly identical with Horst's species. But the modification of the setæ in the clitellar region of *Thamnodrilus* is more complete than

Fig. 2.

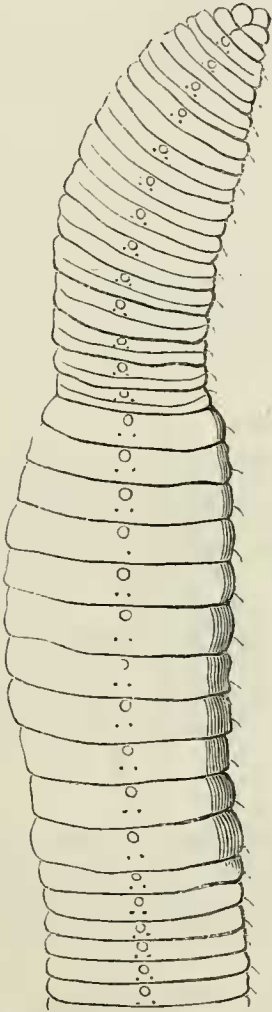


Fig. 3.

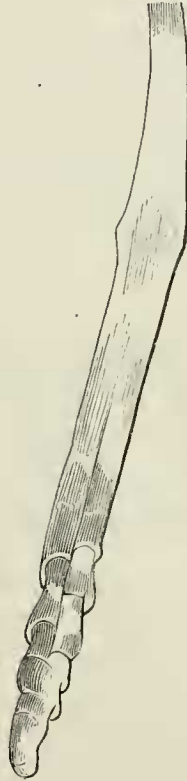


Fig. 2. *Thamnodrilus guielmi*. Anterior segments seen laterally; apertures of the nephridia in front of the dorsal pair of setæ; segments of clitellum shaded vertically. Magnified twice natural size.

Fig. 3. Seta from one of the segments of the clitellum; highly magnified.

in *Urochæta*, inasmuch as it has affected the dorsal as well as the ventral pairs. The clitellar setæ are larger than the ordinary setæ, as well as differing in their ornamentation; this difference was very noticeable in an immature example, where the difference of age alone

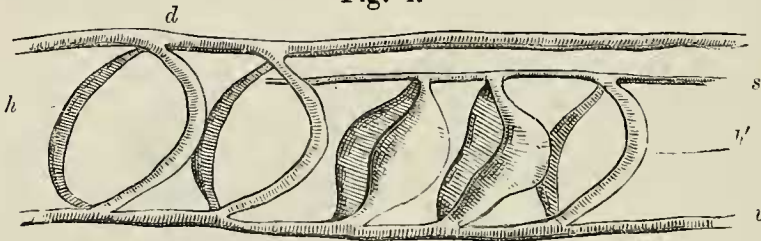
distinguished the clitellar from the ordinary setæ; moreover I have frequently found even in mature examples that the clitellar setæ of both dorsal and ventral pairs only showed slight traces of ornamentation at their free extremity; such setæ alternated in the most irregular fashion with setæ like that displayed in the drawing (fig. 3); they are, however, of equal size.

Dorsal pores appear to be entirely absent.

The only *apertures* besides the mouth and anus recognizable on the exterior of the body are those of the nephridia, which are placed in front of the dorsal pair of setæ close to the anterior margin of the segment (fig. 2); these apertures were especially plain upon the clitellum.

Vascular System.—In none of my specimens was the vascular system very well preserved. The *dorsal vessel* (fig. 4, *d*) runs close to the surface of the gizzard, and near to the hinder end of that organ gives off two pairs of slender trunks (*h*) to the ventral vessel (*v*). After this the dorsal vessel runs some way above the surface of the œsophagus, and is not directly connected with the ventral vessel; segments 10, 11, and 12 contain each a pair of lateral “hearts” (*h*),

Fig. 4.



Chief Trunks of Vascular System.

d, the dorsal vessel; *v*, ventral vessel; *s*, supraintestinal; *h*, anterior “hearts” connecting dorsal and ventral vessel; *h'*, posterior hearts connecting supraintestinal and ventral vessel.

of which the two anterior pairs are considerably stouter than the posterior pair; these are given off from the supraintestinal trunk (*s*), which is of some thickness in these segments. I could not detect any additional communication with the dorsal vessel, and am inclined to think that there is none.

Alimentary Canal.—The *mouth-aperture*, as already stated, is terminal, and in all my specimens was excessively minute; the *buccal cavity* is thick-walled and very narrow, with an almost imperceptible lumen. The *pharynx* is large, and is followed by a wide thin-walled *œsophagus*. The œsophagus is remarkable for the fact that it does not pass straight to the gizzard, but is bent upon itself, forming a loop: it might be readily imagined that this condition is simply due to the contraction produced by the preservative reagent; but I found the same condition of the œsophagus in all the specimens that I dissected, and in all of these the gizzard was apparently retracted

rather than protruded, and the segments of the body in most instances were perfectly normal and not unduly contracted. The *gizzard* is like that of other Earthworms.

Œsophageal Glands.—Behind the gizzard and in front of the intestines the œsophagus is furnished with certain glands, which are evidently the homologues of similarly placed glands in other Earthworms. These glands are kidney-shaped and lie on the dorsal or lateral aspect of the œsophagus, with the concave side turned towards the œsophagus; at the middle of its concavity the gland is connected with the œsophagus by a short duct. The general appearance of these glands is strikingly similar to the “kidney-shaped glands” which I have described¹ in the intestinal region of *Megascolex cæruleus*; apparently they also resemble in outward appearance the œsophageal glands of *Notoscolex camdenensis*², though frequently the œsophageal glands of Earthworms have not this peculiar shape.

The œsophageal glands of *Thamnodrilus* are furnished with a very abundant blood-supply. This blood-supply is derived from the supraintestinal trunk, and not from the dorsal vessel; in the case of the two posterior pairs, at any rate, of these glands, a branch is given off on either side from the supraintestinal vessel; this at once divides into two trunks; the inner branch goes to the septum and ramifies upon its surface; the outer branch conveys blood to the œsophageal gland, which it reaches by passing along the pedicle by which that gland is attached to the œsophageal walls; the vessel then breaks up into a network of capillaries on both the anterior and posterior surfaces of the gland. It is important to notice that in these segments both the dorsal region of the mesentery and the œsophageal gland are supplied with blood from the supraintestinal trunk; the dorsal vessel gives off no branches in these segments. In *Urochæta* the calciferous glands have, according to Perrier, a similar blood-supply.

There were altogether six pairs of these glands situated in segments 9–14; the last two pairs, *i. e.* those situated in segments 13 and 14, were situated nearer to the dorsal surface of the intestine than those which precede them. The number of those glands (six pairs) is unusual, three being the almost constant number of pairs in other Earthworms; in certain species of *Perichæta*, however, there appear to be as many as six pairs of œsophageal glands.

Body-cavity.—The dissection of this part of the body was rendered very difficult by the toughness of the septa in this region and by their firm connection with one another by numerous tendinous threads; these septa, however, in *Thamnodrilus*, are not specially thickened, as they are in many other Earthworms, but are thin and transparent, as in the posterior region of the body.

The body communicates with the exterior only by the apertures of the nephridia; there are no dorsal pores present.

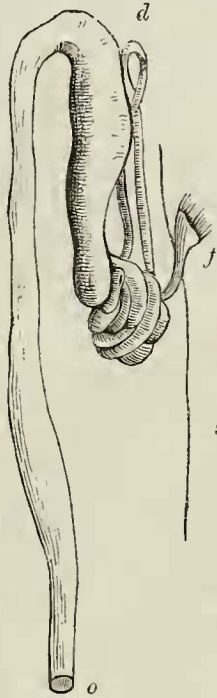
¹ Trans. Roy. Soc. Edinb. vol. xxxii.

² Proc. Linn. Soc. N. S. W. 1886, pl. viii. fig. 1, *i.g.*

Nephridia.—The nephridia appear to be present in all the segments of the body with the exception of the first; they are differentiated into three series.

(1) The first series consists of only one pair of nephridia; these differ from those which follow in their structure and in their position. They lie beneath the œsophagus and are completely hidden by it; each gland consists of a flattened mass of glandular tubules, produced by the coil, which has the ordinary structure characteristic

Fig. 5.



One of the Anterior Nephridia.

o, external aperture; *f*, funnel opening on to the other side of the intersegmental septum *s*; *d*, glandular vesicle.

of nephridial tubules, except that the coils are more numerous. The tubule opens into a stout-walled muscular duct, distinguishable by its yellowish colour, which passes anteriorly in a somewhat sinuous course and opens on to the second segment of the body. These glands evidently correspond to the "glandes à mucosité" described by Perrier in *Urochaeta*¹, and by myself in *Acanthodrilus multiporus*². The funnel was very conspicuous in transverse sections. This pair of nephridia differs less from the succeeding pairs than in many other genera. The specialization of this first pair of nephridia,

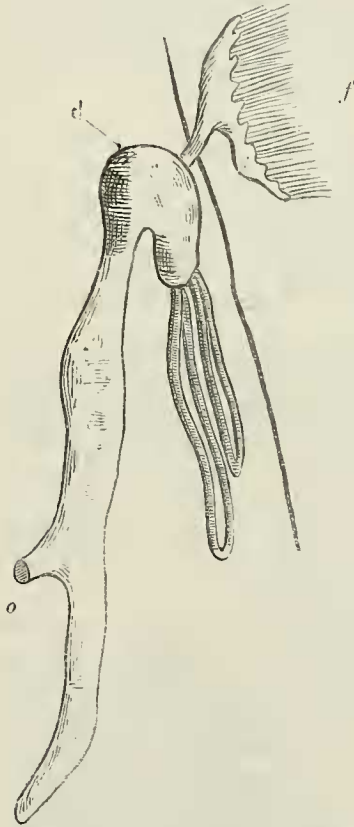
¹ Arch. de Zool. Exp. t. iii.

² P. Z. S. 1885.

which is so well marked in *Urochæta* and in *Acanthodrilus multiporus*, is, as it were, just commencing in *Thamnodrilus*.

(2) The next fourteen pairs of nephridia (see fig. 5) open on to the exterior of the body in a line with the dorsal pair of setæ; the most anterior nephridia are rather smaller than the posterior pairs in corresponding with the increasing width of the segments. The glandular part of the nephridium is very slightly developed in comparison with the extremely elongated muscular sac which communicates with the exterior; at the junction of the two regions of the nephridium, the

Fig. 6.



One of the Posterior Nephridia. Lettering as in fig. 5.

muscular duct becomes dilated and bent slightly upon itself; its walls become glandular; this portion of the gland is distinguishable by its opaque white appearance.

(3) From the 17th segment to the end of the body the nephridia are of a somewhat different character to those which precede them; the muscular sac of the gland is well developed and opens on to the exterior at the same point as in the anterior segments; it differs in being furnished with a diverticulum which is nearly as long as itself; the glandular region of the nephridium is more

complicated in the first few segments after the 17th than in the posterior segments of the body; the proximal end of the muscular duct passes into a somewhat dilated pear-shaped glandular vessel, into which opens the nephridial tubule; in the posterior nephridium (see fig. 6) the nephridial tubule is very short and bent upon itself four times, the four tubes running parallel with each other; at a point about opposite to the glandular vesicle the tubule perforates the mesentery and reaches the interior of the segment lying in front of that which contains the distal part of the organ; here it ends almost immediately in the nephridial funnel, which is very large and conspicuous; instead of being a simple funnel-shaped expansion, as in the majority of Earthworms and in the anterior nephridia of this species, this region of the nephridium forms an elongated folded membrane apparently closely agreeing with the nephridial funnel of *Anteus*¹; this membrane is composed of the ordinary columnar ciliated cells.

Reproductive Organs.—There are two pairs of *vesiculæ seminales*, situated in segments 11 and 12; each of these bodies is somewhat kidney-shaped and flattened laterally; the membrane covering the vesiculæ is continued over the funnels of the vasa deferentia which open into the same segments. The true testes were conspicuous in a young specimen which I investigated by means of transverse sections.

I traced back the vasa deferentia, as an excessively fine tube, as far back as the 18th segment, where it appears to open close to the ventral median line. I could not, however, detect the actual orifices of the vasa deferentia. Prostate glands appear to be entirely absent, as in many (e.g. *Urochæta*, *Microchæta*) of Perrier's *Intraclitellians*; this group, however, cannot be distinguished by the absence of prostate glands, which are present in *Eudrilus*, *Megascolex*, and *Typhaeus*. The ovaries are situated in the usual position in segment 13; they are small digitate glands.

The *oviducts* open by expanded funnels into the 13th segment which are placed close to the nerve-cord; their ducts perforate the mesentery and open on to the exterior in the 14th segment. I did not, however, observe the actual orifice, which must be well within the ventral pairs of setæ, if not actually unpaired and median.

Spermatheca.—I opened one or two mature individuals and failed to find these organs; they are, however, usually present to the number of a single pair in the seventh segment. Each spermatheca is a simple, spherical, or pear-shaped pouch without any diverticulum; it opens exactly in front of the nephridium of the same segment.

It appeared to me at first that this Earthworm might possibly belong to the genus *Anteus*, E. P.²

Perrier's description of the genus is not very complete, as it necessarily depended upon a unique example which could be only partially dissected.

¹ Perrier, *Nouv. Arch. d. Mus. t. viii. pl. i. fig. 14.*

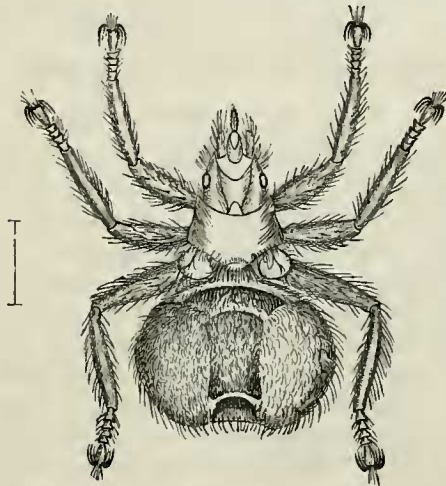
² "Recherches," &c. *Nouv. Arch. d. Mus. t. viii. p. 49.*

Anteus agrees with *Thamnadrilus* in the absence of dorsal pores, in the arrangement of the setæ, the position of the nephridiopores, the characters of their internal funnel, and in the presence of a single pair of spermathecæ in the 7th segment. Both genera have two pairs of vesiculæ seminales in segments 11 and 12. The main external points of difference appear to be in the clitellum, which is much more extensive in *Anteus* than in *Thamnadrilus*, and in the modification of the clitellar setæ in the latter genus. In *Thamnadrilus* the anterior mesenteries are not specially thickened as they are in *Anteus* and there is no modification of the nephridia in the genital segments. Whatever may be the way in which the genital products are carried off in *Anteus*, the genital ducts of *Thamnadrilus* are perfectly normal. *Anteus*, like *Thamnadrilus*, is a native of the northern part of the South-American continent.

6. Note on a new Parasitic Dipterous Insect of the Family Hippoboscidæ. By CHARLES O. WATERHOUSE.

[Received January 31, 1887.]

The insect here described was found by Dr. R. W. Shufeldt¹ at Fort Wingate, New Mexico, on a species of Swift (*Cypselus melano-leucus*), and transmitted to Mr. Sclater for examination. It is closely allied to *Anopera pallida*, a European Dipterous parasite found on



Cypselus apus. It is, however, much larger, and is at once distinguished by the almost total absence of wings—a character which

¹ See Dr. Shufeldt's paper on this Swift, 'Ibis,' 1887, p. 151.